

What is claimed is:

1. A photoresist composition comprising a photoactive component and a resin, the resin comprising a polymer being at least substantially free of ionic metal contaminants.
2. The photoresist of claim 1 wherein the resin is formed from a polymer that has been prepared by admixing a monomer and a polymerization initiator which has been purified prior to synthesis of the polymer.
3. The photoresist of claim 2 wherein the polymerization initiator has been purified by washing or slurring the initiator with an aqueous solvent.
4. The photoresist of claim 3 wherein the aqueous solvent is water.
5. The photoresist of claim 2 wherein the polymerization initiator has been purified by admixing the polymerization initiator with an organic solvent, and precipitating the initiator from the resulting solution using an aqueous solvent.
6. The photoresist of claim 2 wherein the polymerization initiator has been purified by admixing the polymerization initiator with an organic solvent, precipitating the initiator from the resulting solution using an aqueous solvent, and solvent exchanging the initiator.
7. The photoresist composition of claim 2 wherein the polymer has been further purified following its synthesis using ion-exchange treatment, chromatography or distillation.

8. The photoresist composition of claim 2 wherein the polymerization initiator is a free radical polymerization initiator.
9. The photoresist composition of claim 8 wherein the free radical polymerization initiator is an azo type initiator.
10. The photoresist composition of claim 1 wherein the polymer has less than about 50 ppb ionic metal contaminants.
11. The photoresist composition of claim 1 wherein the polymer has less than about 30 ppb ionic metal contaminants.
12. The photoresist composition of claim 1 wherein the polymer has less than about 20 ppb ionic metal contaminants.
13. The photoresist composition of claim 1 wherein the polymer has less than about 10 ppb ionic metal contaminants.
14. The photoresist composition of claim 1 wherein the polymer has no detectable level of ionic metal contaminants.
15. The photoresist composition of claim 1 wherein the photoresist is a chemically-amplified photoresist.
16. The photoresist composition of claim 1 wherein the resin further comprises photoacid-labile ester units.

17. A method for purifying a polymerization initiator comprising washing or slurring the initiator with an aqueous solvent.

18. The method of claim 17 wherein the aqueous solvent is water.

19. A method for purifying a polymerization initiator comprising admixing the initiator with an organic solvent and precipitating the initiator from the resulting solution.

20. The method of claim 19 wherein the polymerization initiator is further purified by a solvent-exchange treatment.

21. The method of claims 17-20 wherein a purified polymerization initiator is obtained having a metals level of less than about 20 ppm.

22. The method of claims 17-20 wherein a purified polymerization initiator is obtained having a metals level of less than about 10 ppm.

23. The method of claims 17-20 wherein a purified polymerization initiator is obtained having a metals level of less than about 500 ppb.

24. The method of claims 17-20 wherein a purified polymerization initiator is obtained having a metals level of less than about 250 ppb.

25. The method of claims 17-20 wherein the polymerization initiator is a free radical polymerization initiator.

26. The method of claims 25 wherein the free radical polymerization initiator is an azo type initiator.

27. A method for forming a photoresist, comprising:

- (a) reacting a monomer with a polymerization initiator to form a polymer resin;
- (b) admixing the polymer resin with a photoactive component to form a photoresist.

28. The method of claim 27 further comprising applying a coating layer of the photoresist on a substrate, exposing the photoresist coating layer to patterned activating radiation, and developing the exposed photoresist coating layer to form a photoresist relief image.

29. The method of claim 28 wherein the photoresist is exposed to activating radiation that has a wavelength of 248 nm or 193 nm.

30. A method for forming a photoresist relief image, comprising:  
applying a coating layer of a photoresist of claim 1 on a substrate;  
exposing the photoresist coating layer to patterned activating radiation; and  
developing the exposed photoresist coating layer to provide a photoresist relief image.

31. An article of manufacture comprising a substrate having coated thereon a layer of a photoresist of claim 1.

32. A coated substrate comprising:  
a substrate having thereon

- 1) a coating layer of an antireflective composition, and
  - 2) a coating layer of a photoresist over the antireflective layer;
- wherein the antireflective composition comprises a resin component being at least substantially free of ionic metal contaminants.

33. The coated substrate of claim 32 wherein the resin component is formed from a polymer that has been prepared by admixing a monomer and a polymerization initiator which has been purified prior to synthesis of the polymer.

34. The coated substrate of claim 33 wherein the polymerization initiator has been purified by washing or slurring the initiator with an aqueous solvent.

35. The coated substrate of claim 33 wherein the polymerization initiator has been purified by admixing the polymerization initiator with an organic solvent, and precipitating the initiator from the resulting solution using an aqueous solvent.

36. The coated substrate of claim 33 wherein the polymerization initiator has been purified by admixing the polymerization initiator with an organic solvent, precipitating the initiator from the resulting solution using an aqueous solvent, and solvent exchanging the initiator.

37. The coated substrate of claim 33 wherein the polymer has been further purified following its synthesis using ion-exchange treatment, chromatography or distillation.

38. A method for forming a photoresist relief image on a substrate comprising:

- (a) applying on the substrate a layer of an antireflective composition,

(b) applying a layer of a photoresist composition over the antireflective composition layer, and

(c) exposing the photoresist layer to activating radiation and developing the exposed photoresist layer;

wherein the antireflective composition comprises a resin being at least substantially free of ionic metal contaminants.

39. An antireflective coating composition for use with an overcoated photoresist composition, wherein the antireflective composition comprises a resin being at least substantially free of ionic metal contaminants.

40. The antireflective coating composition of claim 38 wherein the antireflective composition comprises a) a resin, b) an acid or thermal acid generator, and c) a crosslinker.